National Defense
Defence nationale

DEFENCE AND CIVIL INSTITUTE OF ENVIRONMENTAL MEDICINE

Canada

May 1988

DCIEM No. 88-RR-13

Traditional and Psychological Risk Factors for Coronary Artery Disease in a Select Military Population: CFCSC 1985-86

M.F. Kavanagh
M.J. Irvine
D.B. Van Loon
T.E. Brown

Defence and Civil Institute of Environmental Medicine
1133 Sheppard Ave West
PO Box 2000
Downsview, Ontario Canada
M3M 3B9

TABLE OF CONTENTS

Page

ABSTRACT 2

INTRODUCTION 3

METHODS

Subjects 4

Data Collection 5

Questionnaire 5

Traditional Risk Factors 5

Statistics 6

RESULTS 6

DISCUSSION 8

TABLES

Table 1 CFCSC Descriptive Statistics 11

Table 2 Frequency Data 12

Table 3 Type A Behavior Data 13

Table 4 Anger, Hostility and Anxiety Data 14

REFERENCES 15

APPENDIX 1 20

ABSTRACT

The Canadian Forces Command and Staff College (CFCSC) project was initiated in 1981 to study coronary risk factors in the CFCSC Canadian student population, who, over the previous few years had exhibited a seven times higher incidence for coronary heart disease (CAD) than the sex and age matched national average. The CFCSC course is considered to be very important for career advancement and it tends to be a very intense, competitive and stressful ten month period. The original project studied the traditional physiological risk factors (ie smoking, serum cholesterol, blood pressure, obesity, family and exercise histories). As a progression from the original project, this study was undertaken to investigate the traditional risk factors for CAD plus several behavioral risk factors (ie type A behavior, anger, anxiety, hostility). These risk factors were measured prior to the course plus at what was considered to be the peak stress period (ie three months into the course) for the students. There were significant increases in body weight, mean triglycerides, high density lipoproteins (HDL), and Framingham risk rating. Serum cholesterol remained constant as did the lipid ratios. There was a significant decrease in alcohol consumption. This population demonstrated a genetic predisposition for CAD with 54% of the students acknowledging a positive family history for CAD. This student population tended toward a type A behavior pattern. However, no significant difference was found between type A and type B students with respect to traditional risk factors either initially or between the two time periods. The only psychological variable to show any significant change between the two time periods was the Anger-in score. However, the difference was too small to be of clinical significance. Hostility is thought to be a more specific risk factor for CAD than type A behavior, but again there was no significant difference between low or high hostility individuals with respect to traditional or psychological risk factors. One goal of this study was to identify individuals at specific risk for CAD due to the presence of particular combinations of psychological and traditional risk factors. However, this study failed to uncover any further risk for CAD than was afforded the students by the individual traditional and psychological risk factors.

INTRODUCTION

The Canadian Forces Command and Staff College (CFCSC) project was initiated in 1981 to study coronary risk factors in the Canadian student population. For several years prior to 1981 the incidence of acute myocardial infarction (MI) among the students, while attending the college, was noted to be seven times higher than the sex and age matched national average (27). The implications of this high rate of coronary artery disease (CAD) are considerable, as the students attending this course are senior officers of the Canadian Forces, many of whom are destined to command positions.

Initially, the traditional physiological risk factors including serum cholesterol, cigarette smoking, blood pressure, family history, exercise history and obesity were studied. Of these, family history of CAD was the only risk factor found to be related to high CAD incidence in the senior CF officer population (27).

Conclusive evidence exists linking CAD to other risk factors. The Framingham data (6,21,22,23) have established age, sex, cigarette smoking, hypertension, hypercholesterolemia, obesity, positive family history for CAD and lack of physical exercise as important risk factors. In addition, various psychological parameters have also been implicated in CAD (2,3,11,16,17,37,41).

The most prominent of these is type A behaviour (20), which is characterized by the hard driving aggressive, competitive, time urgent and impatient person (33). Specifically, this behaviour is associated with both coronary atherosclerosis (3,7,13,14,25,41,44) and carotid artery atherosclerosis (40), although this must be qualified by the studies reporting negative findings (9,10,25,35,42,43). In the first large prospective study, the Western Collaborative Group Study (WCGS), a 2.37 times higher incidence of CAD was discovered among type A than type B individuals (30). Two subsequent studies replicated this finding (16,17,24). It should be noted that two recent prospective studies failed to find an association between type A behaviour and CAD (36) and recurrent myocardial infarction (4). However, one of these two studies (36) was different from that employed in the previous studies in that they were high risk males who had at

least two of three traditional risk factors: smoking cigarettes, elevated cholesterol or elevated blood pressure. These participants were also highly motivated volunteers who were willing to participate in a risk factor modification study. Clearly, the population may have been atypical.

Hostility and anger are likewise positively and independently related to the incidence of CAD (2,18,37). Moreover, hostility is also associated with severity of coronary atherosclerosis independent of the type A behaviour pattern (7,41). Anger expression as a component of hostility is also related to the development of CAD (16,17) and to the severity of coronary atherosclerosis (7).

The intention in 1985-86 was to study traditional risk factors plus various psychological parameters at two specific times during the course. First, a pre-course baseline was established for all Canadian students. Second, their response to the stress of the course was monitored through re-evaluation of the traditional risk factors and repetition of two of the psychological scales.

The objectives of the current project were: 1) to see if there was a worsening of the traditional CAD risk factors in students during the course; 2) to determine if the course was associated with increases in anxiety and anger; 3) to identify specific groups at risk for development of CAD and 4) to see if type A behaviour or high hostility were associated with differences in the traditional CAD risk factors.

METHODS

Subjects

All Canadian students (110 males and 3 females) of the 1985-86 CFCSC course participated in this study. Their mean age ±SD was 36.4±2.6 years (range 31 to 43 years).

The course at CFCSC is 10 months long and tends to expose students to an intense, competitive and gruelling schedule. This exposure is an important stage in the training and career development of selected personnel at the rank of Major, since it prepares those who do well for subsequent senior officer duties.

The posting often requires separation from family or friends, and reguiar home study requirements of up to five hours nightly often preclude normal social activity. Tolerance of continual emotional stress would seem to be a basic requirement for course survival.

Data Collection

All subjects completed the essential questionnaires (see next paragraph) and provided the traditional risk factor information on two occasions during the course. Pre-course data was collected during the first week of the course, September (Sep), for all Canadian students. Subsequently, the College Directing Staff (DS) indicated the peak stress point of the course for each element (land, sea, or air) at which time repeat measurements were made. These periods occurred approximately three months after the initial assessment, in early December (Dec) for the sea element and mid-Dec for the land and air elements.

Questionnaire

Initially, four questionnaires were completed by each student. These were the Jenkins Survey for type A behaviour (19,20) the Cook Medley Hostility Score (5), the Spielberger Anger Expression Questionnaire (39) and the Speilberger Anxiety State-Trait questionnaire (38). Only the latter two questionnaires were repeated at the second data collection point.

Traditional Risk Factors

Each student reported for a blood sample in the fasting state (12 hr) and for measurement of height, weight, bony elbow diameter using calipers, and blood pressure using a mercury manometer. The blood was analyzed for serum cholesterol, triglycerides, high density lipoproteins (HDL) and lipid ratios at the DCIEM lab. The technique for lipid analysis used the standard reagents and enzymes purchased from Worthington Diagnostics (Cholesterol kit #27573, triglyceride #27649 and HDL kit #27918). The subjects were also asked specific questions about their aerobic exercise habits, smoking and alcohol habits plus family histories with respect to cardiac disease. This data were compared with

that of the second data collection period.

The bony elbow measurement was used to determine frame size and the students' body weight was applied to the 1983 Metropolitan Life height-weight charts according to their frame size. The amount of body weight over these recognized norms was determined for each subject.

Finally, an attempt was made to determine the overall risk for each individual based upon the American Heart Association risk factor scale (1) (see appendix 1). This scale incorporates age, family history, weight, smoking, exercise, serum cholesterol, blood pressure and gender into a numerical risk score, which ranges from "well below average" risk to "urgent".

Statistics

The statistical analyses incorporated paired t-tests and repeated measures ANOVA between the values for Sept and Dec. Regression equations were formulated using the psychological data in an attempt to predict other traditional risk factors for CAD. The level of significance was set at $p<0.05$.

RESULTS

The means and standard deviations for all of the traditional risk factors are presented in Table 1. Included also are the data from the 1984-85 CFCSC project for comparison to the Sep and Dec data of 1985-86.

There were significant increases in body weight, mean triglycerides, HDL, and Framingham risk rating (1) between Sep and Dec. Serum cholesterol levels and lipid ratios remained constant during this period, while alcohol consumption decreased significantly. The increase in Framingham risk, while small, was statistically significant, showing an increase in risk for CAD over a short period of time.

Frequency data for cigarette smoking, family history, exercise history and the Framingham risk rating are described in table 2. An interesting finding is that the number of cigarette smokers actually declined while, the percentage of

smokers (22%) is already well below the national average of 31% (12). However, this decrease in the number of smokers was not statistically significant. The changes in the Framingham risk rating is illustrated by an increase in people falling into the "moderate" risk category.

The students were given one and a half hours at noon each day during which time they were strongly encouraged to exercise and were forbidden to work on course assignments. Many students started out exercising but as the year progressed the amount of exercise declined. This decreased exercise involvement would adversely affect the individual's risk profile.

Family history data suggest a genetic predisposition to CAD (28). Fiffy-four percent of the students had a positive family history for CAD.

Type A behaviour data for the 1984-85 course and the Sep 1985-86 course are presented in table 3. For comparison, the results for U.S. air force personnel, WCGS managerial personnel and WCGS male survivors of an MI are presented. The type A measures comprise the global type A score plus three subcomponent scores: S score (speed and impatience), J score (job involvement) and H score (hard driving and competitive). The raw scores are weighted and converted to standardized scores based upon the normative sample (20). Positive scores indicate type A behaviour and negative scores indicate type B behaviour. This CFCSC population tends toward the type A behaviour pattern with a mean of 1.3. With regard to the subcomponents of type A behaviour, the subjects clearly exhibit the job involvement characteristic of type A behaviour but they tend toward type B behaviour on the speed and impatience factor and the hard-driving and competitive factors. Comparison of this CFCSC population with the students of the 1984-85 CFCSC course suggests that the students in the 1985-86 course are somewhat less type A than their predecessors.

Shown Table 4 are the means and standard deviations for hostility, anger, anxiety and the repeat measures of anger and anxiety at Dec 1985-86. Anger in is a measure of one's tendency suppress as opposed to express (anger out) feelings of anger. Anxiety trait reflects one's propensity to be anxious, whereas anxiety state reflects anxious feelings at that moment. The only parameter to show statistical significance was anger in and the clinical significance of this minute change is

debatable.

An ANOVA was carried out on the type A score, both type A vs type B and quartiles from low type B to high type A, with respect to all other traditional risk factors. No significant difference was found in either Sep or Dec risk factors or for the difference in risk factors between the two time periods.

Regression equations were formulated using the various psychological parameters to predict the values for other traditional risk factors. The predictability was very low, for the greatest amount of variance explained by the equations was only 25% with most of the equations yielding predictions much less than 25%.

DISCUSSION

Increase in risk was evident between the two sampling periods. The students generally increased their weight, serum triglycerides and overall risk for CAD while their level of exercise decreased. However, they also increased their HDL values and decreased their alcohol intake both of which are beneficial. This population has a high incidence for positive family history (54%) which is more in keeping with a population with known CAD than a "normal" population (28). Lewis et al. (27) discovered a 46% incidence of a positive family history in a similar population.

The only psycological variable to show any significant change between Sept and Dec was the Anger-in score. However, the difference is of little clinical significance. These findings may be a result of the students not responding to the stress in such a way that would be reflected by questionaire responses. It is also possible that the increase of stress by the time of the second sampling may not have been large enough to be measured. There is also the potential bias of the students answering the questions the way they think they should, rather than by how they actually feel.

One aim of this project was to identify a group specifically at risk for CAD so that future intervention would reduce the risk for CAD. Specific testing procedures were sought to make identification of the high risk group easier. It

appears that the best one can offer is identification of those with type A versus type B behaviour. Identifying the type A individuals has some value if a behaviour modification program is available. As shown by Roskie et al. (34) and Gill et al. (15), type A behaviour patterns can be influenced and changed to reflect an improved cardiac risk profile.

Type A behaviour has repeatedly been identified as an independent risk factor for CAD (14,31,32). The WCGS (31) found the relative risk for type A men aged 30-49 to be 1.87 and 2.16 for 50-59 yr old men. They also found a strong relationship between traditional risk factors of serum cholesterol, cigarette smoking and systolic blood pressure to CAD. The important point is that the WCGS is a population with known CAD, not a healthy population in which one is trying to predict CAD. The CFCSC population was free of CAD and an attempt was made to identify those men who would manifest CAD at a later date.

Altering type A behaviour can profoundly affect one's survival from a CAD event. Type A behaviour modification reduced the re-infarction rate by four times in a group of post-infarction patients (32). Perhaps by lowering type A behaviour prior to infarction such an event could be prevented. Gill et al. (15) demonstrated in middle-aged military officers that type A behaviour could be reduced through effective counselling. The subjects who demonstrated a reduction in type A behaviour also showed lower serum cholesterol values at the time of peak stress. Of note is the fact that their effectiveness as officers and leaders, as assessed by their peers, was in no way altered by this behaviour modification program. Roskies et al. (34) also demonstrated significant changes in type A behaviour with no loss of job performance in a group of professionals and executives in Montreal.

The hostility scores were analyzed by a t-test for Sept and Dec with respect to low (≤ 10) or high hostility (>10). The value 10 was chosen because of the work by Williams et al. (41). There did not appear to be any significant differences between these two groups with respect to the traditional risk factors or other psychological parameters for Sept or Dec data collection period or for the difference between these two data points.

All variables were analyzed by element (land, sea, air) and comparisons were made between the elements. There did not appear to be any significant differences as far as risk for CAD between the various elements of the CF.

The results of this project indicate that there were no clinically significant changes in the biochemical or behavioural parameters for CAD during the three month observation period. This does not imply that the level of stress was not adequate to invoke the anticipated physiological or psychological responses, but rather, the times chosen for data collection may not have been representative of either baseline or peak stress, and some of the effects may be masked by differences among the students' perception of the stress. It is possible that the stress associated with attending CFCSC was actually in effect before arriving at the College, either self induced or by reputation. It is also possible that the biochemical parameters may not respond to stress or that some of the variables, for example serum cholesterol, may require longer than three months to manifest the effects of the imposed stress.

Very recent evidence (8,29) suggests that type A behavior may not be an independent risk factor for CAD. In fact, this evidence suggests that type B behavior increases one's risk for secondary CAD. It appears that the simplistic view of type A versus type B behavior is not sufficient to explain coronary risk, but rather, sub-components such as hostility may be of greater significance. This new evidence reinforces the need for further study into the behavioral aspects of CAD.

In summary, this study identified coronary risk factors, both traditional and behavioral, in a select military population under the stress of a ten month career enhancing course. However, this study failed to uncover any further risk for CAD than was afforded the students by the individual traditional and psychological risk factors.

Table 1 CFCSC Descriptive Statistics

Mean ±SD

Variable	Course 1984-85	Course 1985-86 Sep	Course 1985-86 Dec
Age (yr)	36.8 ±2.4	36.4 ±2.6	
Height (cm)	177.3 ±5.6	180.4 ±6.4	
Weight (kg)	81.8 ±9.6	80.3* ±9.4	81.6 ±9.5
Weight Above Normal (kg)		5.9* ±6.5	6.8 ±6.9
Systolic blood Pressure (mm HG)		126 ±15	121 ±12
Diasolic Blood Pressure (mm HG)		81 ±10	80 ±10
Cholesterol (mg %)	236.1 ±39.2	202.6 ±38.8	203.6 ±37.5
Triglycerides (mg %)	156.7 ±89.5	100.2 * ±43.9	119.2 ±59.7
HDL (mg %)	46.1 ±13.5	52.0 * ±10.0	55.9 ±10.1
Chol/HDL	5.7 ±2.2	4.1 ±1.2	3.1 ±1.1
LDL/HDL	3.9 ±1.9	2.7 ±1.0	2.3 ±0.8
Framingham Risk		21.6 * ±4.6	22.2 ±4.7
Alcohol (drinks/wk)	-	8.2* ±7.7	6.7 ±5.2

* statistical significance of $p<0.05$ Sep to Dec 1985-86 comparison

Table 2 Frequency Data
(% of class)

Variable	Course 1985-86 Sep	Course 1985-86 Dec
Smoking		
Smokers	22.1	20.5
Ex-smokers	35.4	36.6
Non-smokers	42.5	42.9
Family History		
Negative	46	
Positive	54	
Exercise History		
Heavy	59.0	43.8
Moderate	24.8	24.0
Light	2.0	14.3
Nil	14.2	17.9
Framingham Risk		
Below Average	20.4	17.9
Average	53.8	51.7
Moderate	22.2	26.8
Dangerous	3.6	3.6

Table 3 Type A Behavior Data

Mean ±SD

Variable	Course 1984-85	Course 1985-86 Sep	USAF* Personnel	WCGS* Managers	WCGS* Male Survivors of 1-4 years
A score (type A)	2.8 ±9.3	1.3 ±9.4	1.1 ±9.3	1.9 ±9.9	2.6 ±10.4
S score (speed & impatience)	-0.4 ±9.4	-2.5 ±8.6	-2.4 ±8.6	1.1 ±10.0	1.1 ±9.4
J score (job involvement)	8.8 ±6.3	9.0 ±6.7	6.6 ±7.7	1.7 ±9.5	-1.8 ±10.1
H score (hard driving)	-5.6 ±8.7	-4.0 ±8.7	-0.8 ±8.7	1.0 ±9.9	3.3 ±11.1

* Jenkins et al., 1979

Table 4 Anger, Hostility and Anxiety Data
Mean ±SD

Variable	Course 1984-85	Course 1985-86 Sep	Course 1985-86 Dec
Total Anger	47.9 ±5.3	46.1 ±5.4	45.8 ±5.1
Anger in	14.4 ±3.0	25.3 * ±3.0	26.3 ±3.1
Anger out	14.6 ±3.0	13.6 ±3.5	13.1 ±3.2
Hostility	-	12.9 ±5.8	-
Anxiety State	-	33.6 ±8.6	33.6 ±9.9
Anxiety Trait	-	32.9 ±7.1	32.8 ±8.2

* statistical significance of $p<0.05$ Sep to Dec 1985-86 comparison

REFERENCES

1. American Heart Association (1982). Heart attack risk profile. **Navy Lifeline.** 11:17.
2. Barefoot, J.C., Dahlstrom, G. & Williams, R.B. (1983). Hostility, CHD incidence and total mortality: 25-year follow-up study of 255 physicians. **Psychosom Med.** 45:59-63.
3. Blumenthal, J.A., Williams, R.B., Kong, Y., Schanberg, S.M. & Thompson L.W. (1978). Type A behavior pattern and coronary atherosclerosis. **Circulation.** 58:634-639.
4. Case, R.B., Heller, S.S., Case, N.B. & Moss A.J. (1985). Type A behavior and survival after acute myocardial infarction. **New Eng J Med.** 312:737-741.
5. Cook, W.W. & Medley, D.M. (1954). Proposed hostility and pharisaic virtue scale for the MMPI. **J Appl Psychol.** 38:414-418.
6. Dawber, T.R. (1980). **The Framingham Study: The Epidemiology of Atherosclerotic Disease.** Harvard University Press. Cambridge, Mass.
7. Dembroski, T.M., MacDougall, J.M., Williams, R.B., Haney, T.L. & Blumenthal, J.A. (1985). Components of Type A, hostility and anger-in: relationship to angiographic findings. **Psychosom Med.** 47:219-233.
8. Dimsdale, J.E. (1988). A perspective on Type A behavior and coronary disease. **New Eng. J. Med.** 318:110-112.
9. Dimsdale, D.S., Hackett, T.P., Hutter, A.M., Block, P.C. & Catanzano, D. (1978). Type A behavior and extexnt of coronary atherosclerosis. **Am J Cardiol.** 42:583-585.
10. Dimsdale, D.S., Hackett, T.P., Catanzano, D.M. & While, P.J. (1979). The relationship between diverse measures for Type A personality and coronary angiographic findings. **J Psychosom Res.** 23:289-293.
11. Dorian, B. & Taylor C. (1984). Stress factors in the development of coronary artery disease. **J Occup Med.** 26:747-756.

12. Fitness and Amateur Sport (1983). **Canada Fitness Survey Highlights #21.** Ministry of Supply and Services. Ottawa.

13. Frank, K.A., Heller, S.S., Kornfield, D.S., Sporn, A.A. & Weiss, M.B. (1978). Type A behavior pattern and coronary angiographic findings. **JAMA.** 240:761-763.

14. Friedman, M., Rosenman, R.H., Straus, R., Wurm, M. & Kositchek, R. (1968). The relationship of behavior pattern A to the state of the coronary vasculature. **Am J Med.** 44:525-536.

15. Gill, J.J., Price, V.A., Friedman, M., Thoresen, C.E., Powell, L.H., Ulmer, D., Brown, B. & Drews, F.R. (1985). Reduction in Type A behavior in middle-aged American military officers. **Am Heart J.** 110:503-514.

16. Haynes, S.G., Levine, S., Scotch, N., Feinleib, M. & Kannel, W.B. (1978a). The relationship of psychosocial factors to coronary heart disease in the Framingham study I. methods and risk factors. **Am J Epidemiology.** 107:362-383.

17. Haynes, S.G., Feinlieb, M., Scotch, N. & Kannel, W.B. (1978b). The relationship of pyschosocial factors to coronary heart disease in the Framingham study II. prevalence of coronary heart disease. **Am J Epidemiology.** 107:384-402.

18. Haynes, S.G., Feinleib, M. & Kannel, W.B. (1980). The relationship of psychological factors to coronary heart disease in the Framingham study. **Am J Epidemiol.** 111:37-58.

19. Jenkins, C.D., Rosenman, R.H. & Zyzanski, S.J. (1974). Prediction of clinical coronary heart disease by a test for the coronary-prone behavior pattern. **New Eng J Med.** 290:1271-1275.

20. Jenkins C.D., Zyzanski, S.J. & Rosenman R.H. (1979). **Jenkins Activity Survey.** The Psychological Coporation. New York.

21. Kannel, W.B., McGee, D.L. & Gordon, T. (1976). A general cardiovascular risk profile: The Framingham Study. **Am J Cardiol.** 38:46-51.

22. Kannel, W.B., Doyle, J.T., Ortfield, A.M., Jenkins, C.D., Kuller, L., Podell, R.N. & Stamler J. (1984). Optimal resorces for primary prevention of atheroscerotic diseases. **Circulation.** 70:155A-205A.

23. Kaplan, N.M. & Stamler, J. (1983). **Prevention of Coronary Heart Disease.** W.B. Saunders Co. Philadelphia.

24. Kornitzer, M., Kittel, F., Debacker, G. & Dramaix, M. (1981). The Belgian Heart Disease Prevention Project: Type A behavior pattern and the prevalence of coronary heart disease. **Psychosom Med.** 43:133-145.

25. Krantz, D.S., Sanmarco, M.I., Silvester, R.H. & Mathews, K.A. (1979). Psychological correlates of progression of athherosclerosis in men. **Psychosom Med.** 41:467-475.

26. Krantz, D.S., Schaeffer, M.A., Davia, J.E., Dembroski, T.M., MacDougal, J.M. & Shaffer, R.T. (1981). Extent of coronary atherosclerosis, Typae A and cardiovascular response to social interaction. **Psychophysiology.** 18:654-664.

27. Lewis, W.F., Brown, T.E. & Pope, J.I. (1983). Coronary risk in a select Canadian military population. **DCIEM Report** No. 83-R-13.

28. Nora, J.J., Lortscher, R.H., Spangler, R.D., Nora, A.H. & Kimberling, W.H. (1980). Gnetic epidemiologic study on early onset ischemic heart disease. **Circulation.** 61:503-508.

29. Ragland, D.R. & Brand, R.J. (1988). Type A behavior and mortality from coronary heart disease. **New Eng. J. Med.** 318:65-69.

30. Rosenman, R.H., Brand, R.J., Jenkins, C.D., Friedman, M., Stevens, R. & Wurm, M. (1975). Coronary heart disease in the Western Collaborative Group Study: final follow-up experience of 8.5 years. **JAMA.** 233:872-877.

31. Rosenman, R.H., Brand, R.J., Scholtz, R.I. & Friedman, M. (1976). Multivariate prediction of coronary heart disease during the 8.5 year follow-up in the Western Collaborative Group Study. **Am J Cardiol.** 37: 903-910.

32. Rosenman, R.H. (1978). Role of Type A behavior in the pathogenesis of ischemic heart disease, and modification of prevention. **Adv Cardiol.** 25:35-46.

33. Rosenman, R.H. & Chesney, M.A. (1980). The relationship of Type A behavior pattern to coronary heart disease. **Activitas Nervosa Superior.** 22:1-45.

34. Roskies, E., Spevack, M., Surkis, A., Cohen, C. & Gilman, S. (1978). Changing the coronary-prone (Type A) behavior in the non-clinical population. **J Behav Med.** 1:201-216.

35. Scherwitz L., McLelvain, R., Laman, C., Patterson, J., Dutton, L., Yusim, S., Lester, J., Kraft, I., Rochelle, D. & Leachman, R. (1983). Type A behavior, self-involvement and coronary atherosclerosis. **Psychosom Med.** 45:47-57.

36. Siegel, J.M. (1984). Type A behavior: epidemiologic foundation and public health implications. **Ann Rev Pub Health.** 5:343-367.

37. Shekelle, R.B., Gale, M., Ostfeld, A.M. & Paul, O. (1983). Hostility, risk of coronary heart disease and mortaliity. **Psychosom Med.** 45:109-114.

38. Speilberger, C.D. (1975) **Manual for the State-Trait Anxiety Inventory.** Consulting Psychologists Press Inc. Palo Alto, Calif.

39. Spielberger, C.D., Johnson, E.H., Russell, S.F., Jacobs, G.A. & worden, T.J. (1985). **The experience and expression of anger: construction and validation of an anger expression scale.** Hemisphere Co. New York.

40. Stevens, J.H., Turner, C.W., Rhodenwatt, F. & Talbot, S. (1984). The Type A behavior pattern and carotid artery atherosclerosis. **Psychosom Med.** 46:105-113.

41. Williams, R.B., Haney, T.L., Lee, K.L., Blumenthal, J.A. & Whalen, R.E. (1980). Type A behavior, hostility and coronary atherosclerosis. **Psychosom Med.** 42:539-549.

42. Young, L.D., Baboriak, J.J., Anderson, A.B. & Hoffman, R.G. (1980). Attitudinal and behavioral correlates of coronary heart disease. **J Psychosom Res.** 24:311-318.

43. Young, L.D., Barboriak, J.J., Hoffman, R.G. & Anderson A.J. (1984). Coronary-prone behavior attitudes in moderate to severe coronary artery occlusion. **J Behav Med.** 7:205-215.

41. Zyzanski, S.J. Jenkins, D., Ryan, T.J., Flessas, A. & Everist, M. (1976). Psychological correlates of coronary angiographic findings. **Arch Int Med.** 136:1234-1237.

Heart attack risk profile

What are your chances of suffering a heart attack? Doctors and researchers generally associate the factors on this chart with an increased danger of heart disease. Add your numerical score for each category. The American Heart Association interprets risk levels as follows:

Total	Risk
6-11	Well below average
12-17	Below average
18-24	Average
25-31	Moderate risk
32-40	Dangerous
41-62	Urgent – if you have not consulted your doctor about your heart's health recently, do it now.

AGE	10 to 20 — 1	21 to 30 — 2	31 to 40 — 3	41 to 50 — 4	51 to 60 — 6	61 to 70 (and over) — 8
HEREDITY	No known history of heart disease — 1	1 relative over 60 with cardio-vascular disease — 2	2 relatives over 60 with cardio-vascular disease — 3	1 relative under 60 with cardio-vascular disease — 4	2 relatives under 60 with cardio-vascular disease — 6	3 relatives under 60 with cardio-vascular disease — 7
WEIGHT	More than 5 lbs. below standard weight — 0	-5 to + 5 lb. standard weight — 1	6-20 lbs. overweight — 2	21-35 lbs. overweight — 3	36-50 lbs. overweight — 5	51-65 lbs. overweight — 7
TOBACCO SMOKING	Non-user — 0	Cigar and/or pipe — 1	10 cigarettes or fewer a day — 2	20 cigarettes a day — 4	30 cigarettes a day — 6	40 cigarettes a day or more — 10
EXERCISE	Intense occupational and recreational exertion — 1	Moderate occupational and recreational exertion — 2	Sedentary work and intense recreational exertion — 3	Sedentary work and moderate recreational exertion — 5	Sedentary work and light recreational exertion — 6	Complete lack of all exertion — 8
***CHOLESTEROL OR FAT % IN DIET**	Cholesterol below 180 mg. %. Diet contains no animal or solid fats — 1	Cholesterol 181-205 mg. %. Diet contains 10% animal or solid fats — 2	Cholesterol 206-230 mg. %. Diet contains 20% animal or solid fats — 3	Cholesterol 231-255 mg. %. Diet contains 30% animal or solid fats — 4	Cholesterol 256-280 mg. %. Diet contains 40% animal or solid fats — 5	Cholesterol 281-300 mg. %. Diet contains 50% animal or solid fats — 7
****BLOOD PRESSURE (UPPER READING)**	100 — 1	120 — 2	140 — 3	160 — 4	180 — 6	200 or over — 8
GENDER	Female under age 40 — 1	Female age 40-50 — 2	Female over age 50 — 3	Male — 5	Stocky male — 6	Bald stocky male — 7

* The average American diet contains 40% fat.

** If you have no recent reading but have passed an insurance or industrial examination, chances are your upper reading is 140 or less.